SIEMENS

# MOBILETT Plus/ Plus E/ Plus M

[redacted] SP

## Wiring Diagram

From serial No. MOBILETT Plus; 2050
MOBILETT Plus E; 10 001
MOBILETT Plus M; 20 100

SPR8-215.051.01.06.02

English
08-00

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**65 68 583**

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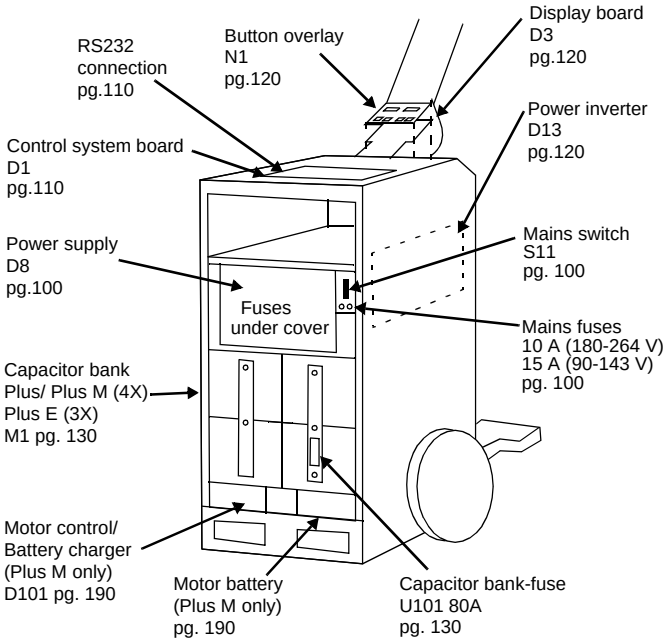
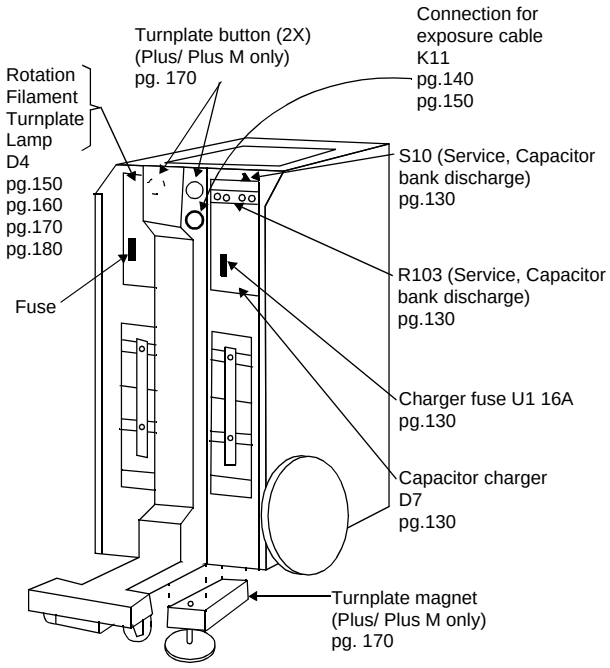
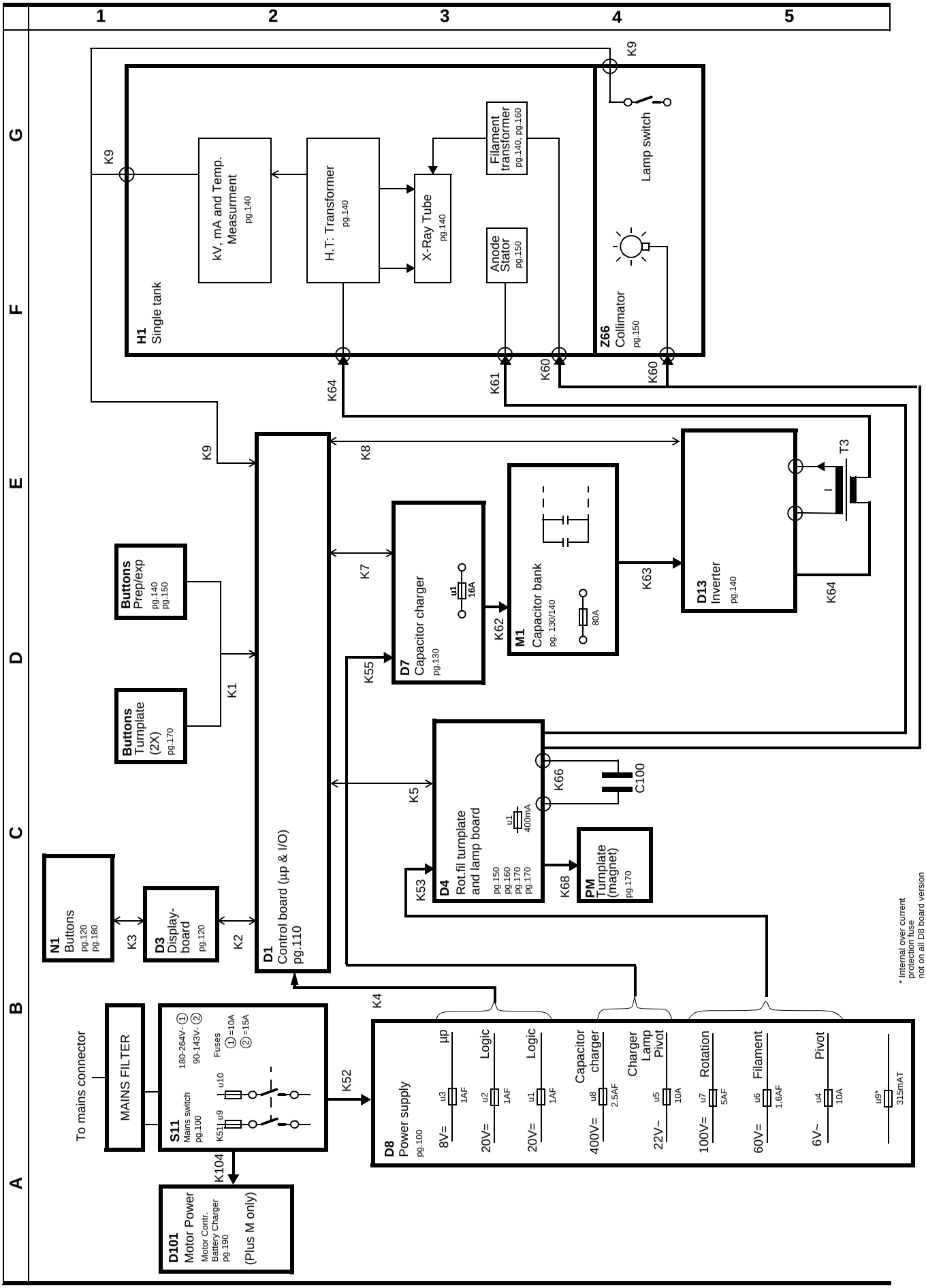
## Notes on block diagram

* The block diagram supports troubleshooting on board level, not on component level.
* The function on D1, control board, described in sheet with number above 110 shows the common function of hard- and software.
  The circuits are only models and do not necessarily exist physically.



# Block diagram system-cable-fuses



## List of boards

| No. | Name | Part No | Type No | On sheet |
|---|---|---|---|---|
| D1 | Control board | 6167022 | X037E | 20, 100, 110, 120, 130, 140, 150, 160, 170, 180 |
| D3 | Display board | 6167170 | X037E | 20, 100, 110, 120, 180 |
| D4 | Rotation, inverter, filament, lamp and turnplate board * | 6077106 | X037E | 20, 100, 110, 150, 160, 170, 180 |
| D7 | Capacitor charger * | 6077247 | X037E | 20, 100, 110, 130 |
| D8 | Power supply * | 6077353 | X037E | 20, 100, 130, 150, 160, 170, 180 |
| D13 | HT-inverter * | 6077270 | X037E | 20, 100, 110, 140 |
| D101 | Motor power (Plus M only) | 6446111 | X037E | 190 |

* Complete unit with heat zink

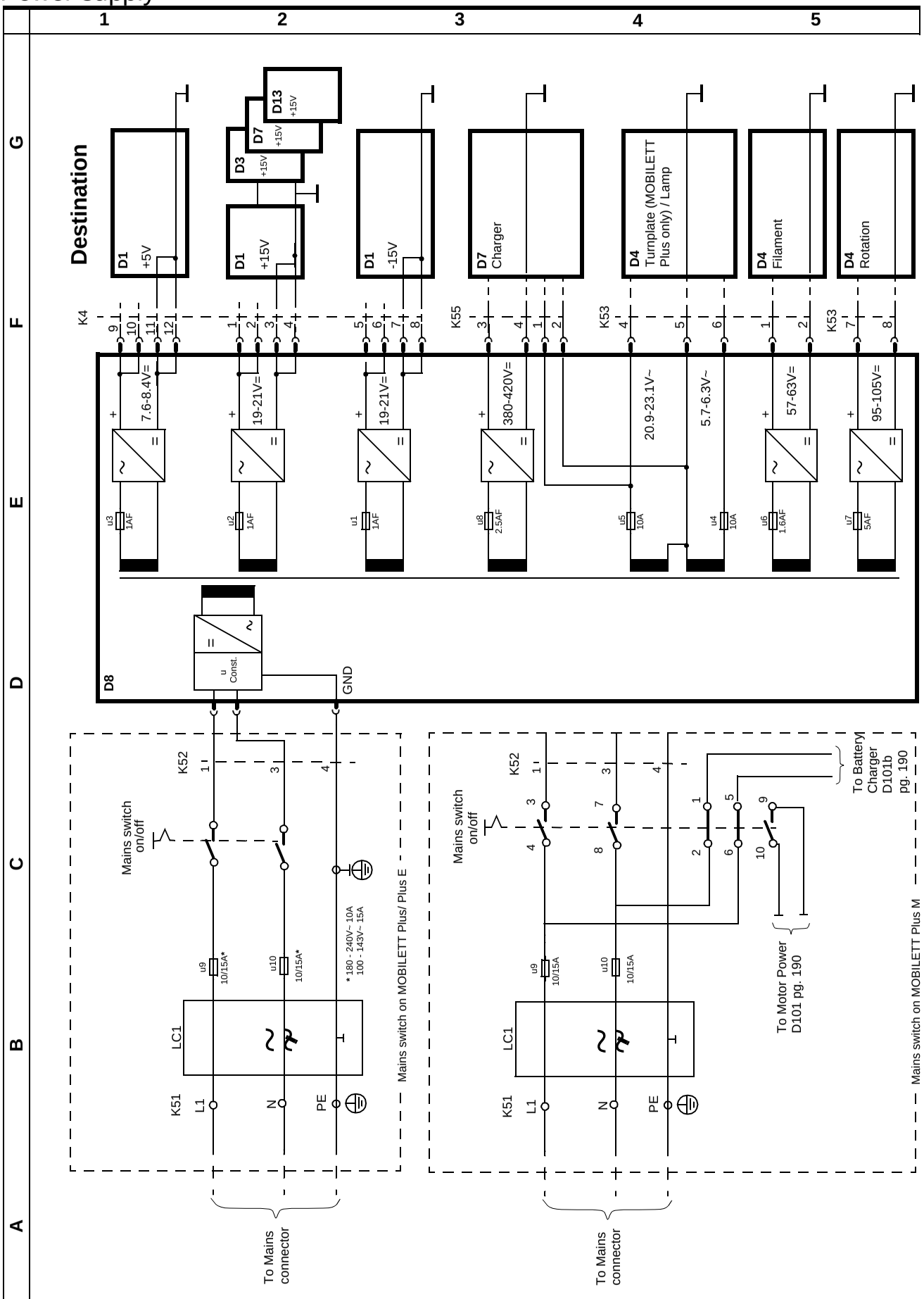
## Measuring points

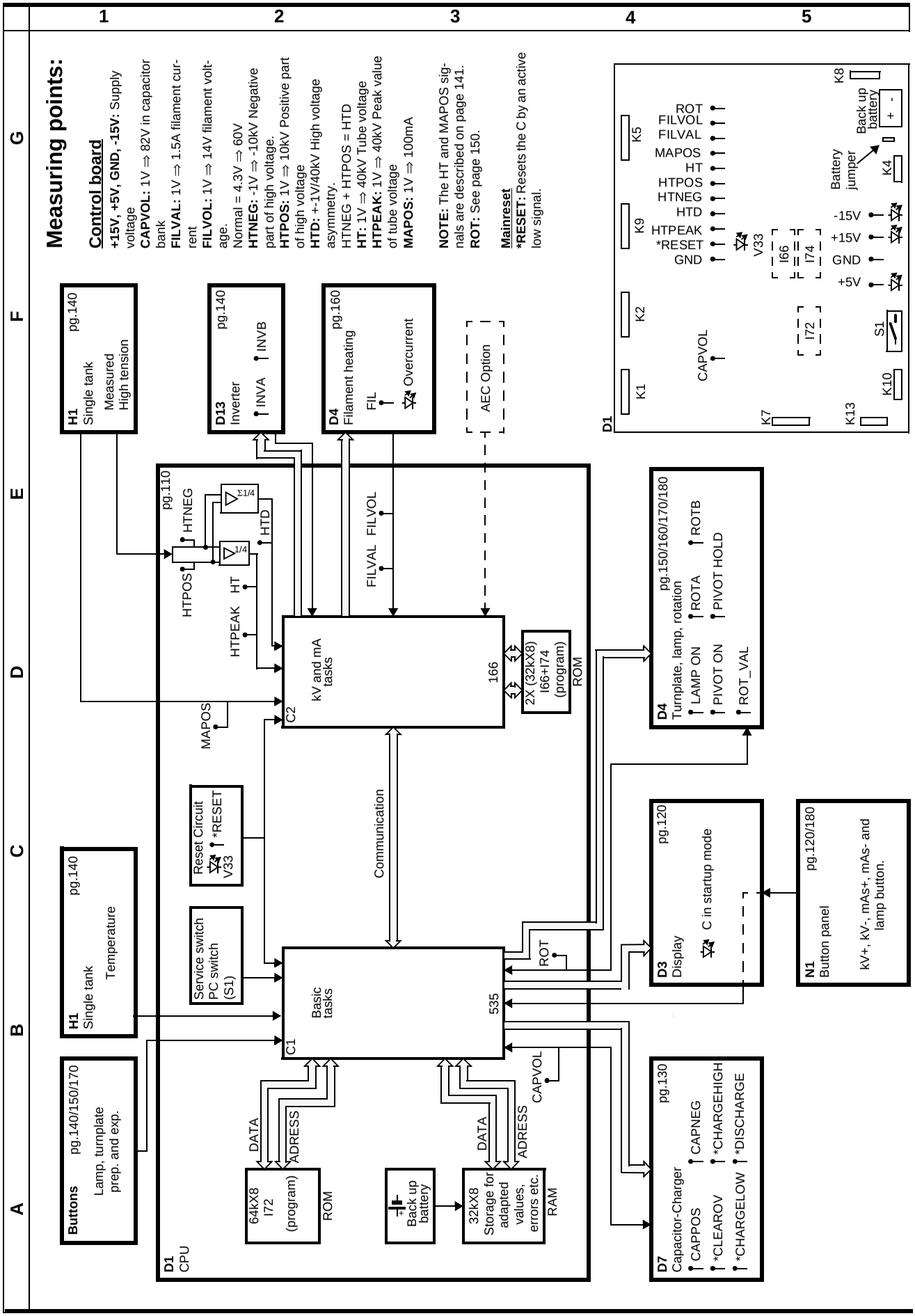
| Name | PC-board | Page | Function |
|---|---|---|---|
| CAPNEG | D7 | 130 | Negative side of capacitor pack |
| CAPPOS | D7 | 130 | Positive side of capacitor pack |
| CAPVOL | D1 | 130 | Voltage level in capacitor pack |
| CHARGEHIGH[2] | D7 | 130 | Charge with high power level |
| CHARGELOW[2] | D7 | 130 | Charge with low power level |
| CLEAROV[2] | D7 | 130 | Reset overvoltage blocking |
| DISCHARGE[2] | D7 | 130 | Discharge capacitor pack |
| FIL | D4 | 160 | Trigger pulses to filament booster |
| FILVAL | D1 | 160 | Current through filament transformer |
| FILVOL | D1 | 160 | Supply voltage for filament heating |
| HT | D1 | 140 | Tube voltage |
| HTD | D1 | 140 | High tension asymmetry |
| HTNEG | D1 | 140 | Negative part of high tension |
| HTPEAK | D1 | 140 | Tube voltage peak value |
| HTPOS | D1 | 140 | Positive part of high tension |
| INVA | D13 | 140 | Trigger pulses to inverter |
| INVB | D13 | 140 | Trigger pulses to inverter |
| LAMP ON | D4 | 180 | Collimator lamp control |
| MAPOS | D1 | 140 | Current through high tension unit. One part corresponds to the real tube current. |
| PIVOT ON | D4 | 170 | Push turnplate down (Plus/ Plus M only) |
| PIVOT HOLD | D4 | 170 | Hold turnplate down (Plus/ Plus M only) |
| RESET[2] | D1 | 110 | Reset signal for up |
| ROT | D1 | 150 | Tube anode speed |
| ROTA | D4 | 150 | Trigger pulses to inverter for anode speed |
| ROTB | D4 | 150 | Trigger pulses to inverter for anode speed |
| ROT_VAL | D4 | 150 | Tube anode speed |

| Power | PC-board | Page | Function |
|---|---|---|---|
| +5V, +15V, -15V, GND | D1 | 110 | --- |
| +5V, GND | D3 | 120 | --- |
| +5V, +15V, GND | D4 | 150 | --- |
| 100VDC, 100VDCRET[1] | D4 | 150 | --- |
| 60VDC, 60VDCRET[1] | D4 | 160 | --- |
| +5V, +15V, GND | D7 | 130 | --- |
| +5V, +15V, GND | D13 | 140 | --- |

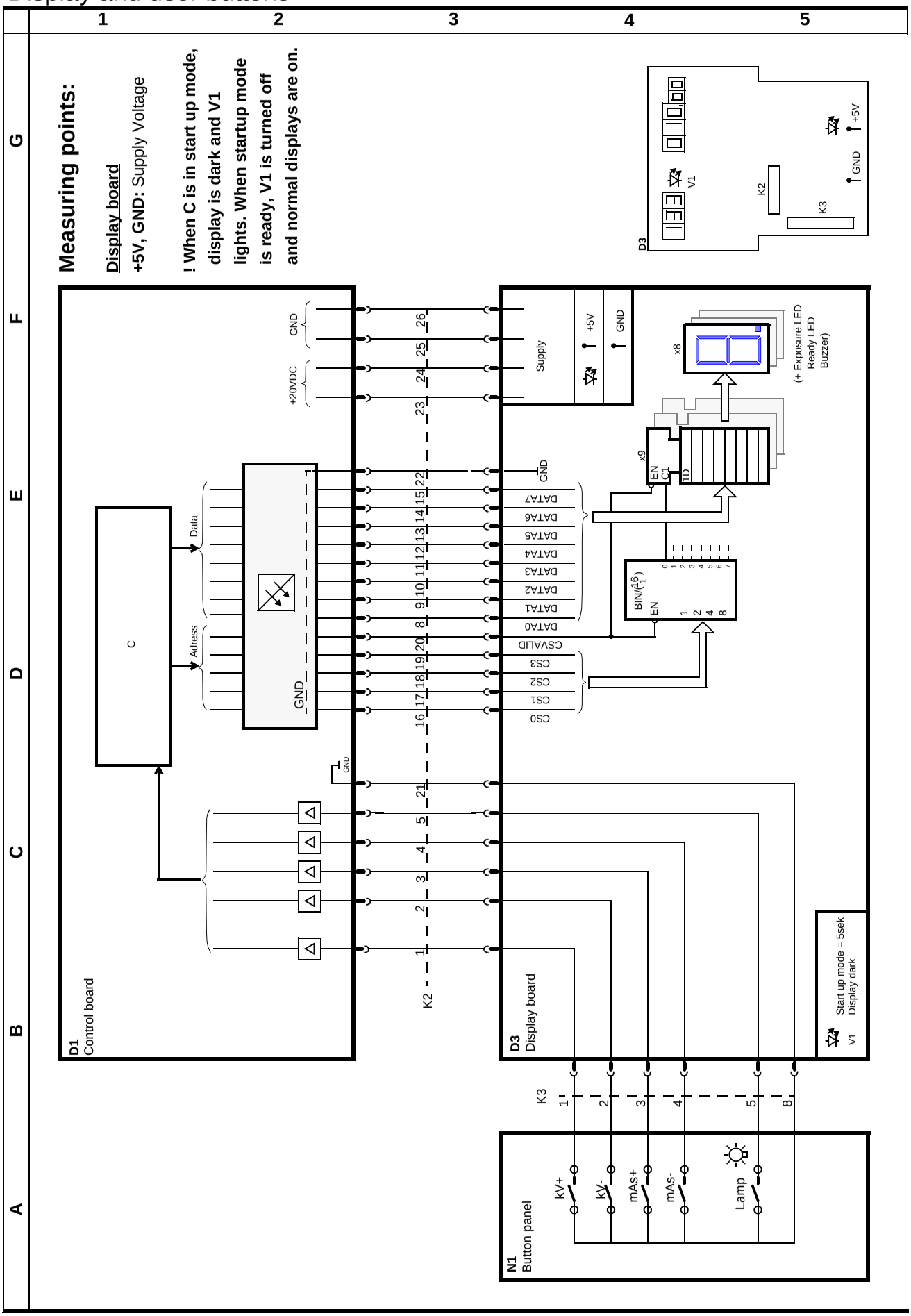
**Notes!**
1) 100VDCRET and 60VDCRET mean the "GND" side of the specified supply voltage
2) Active low function

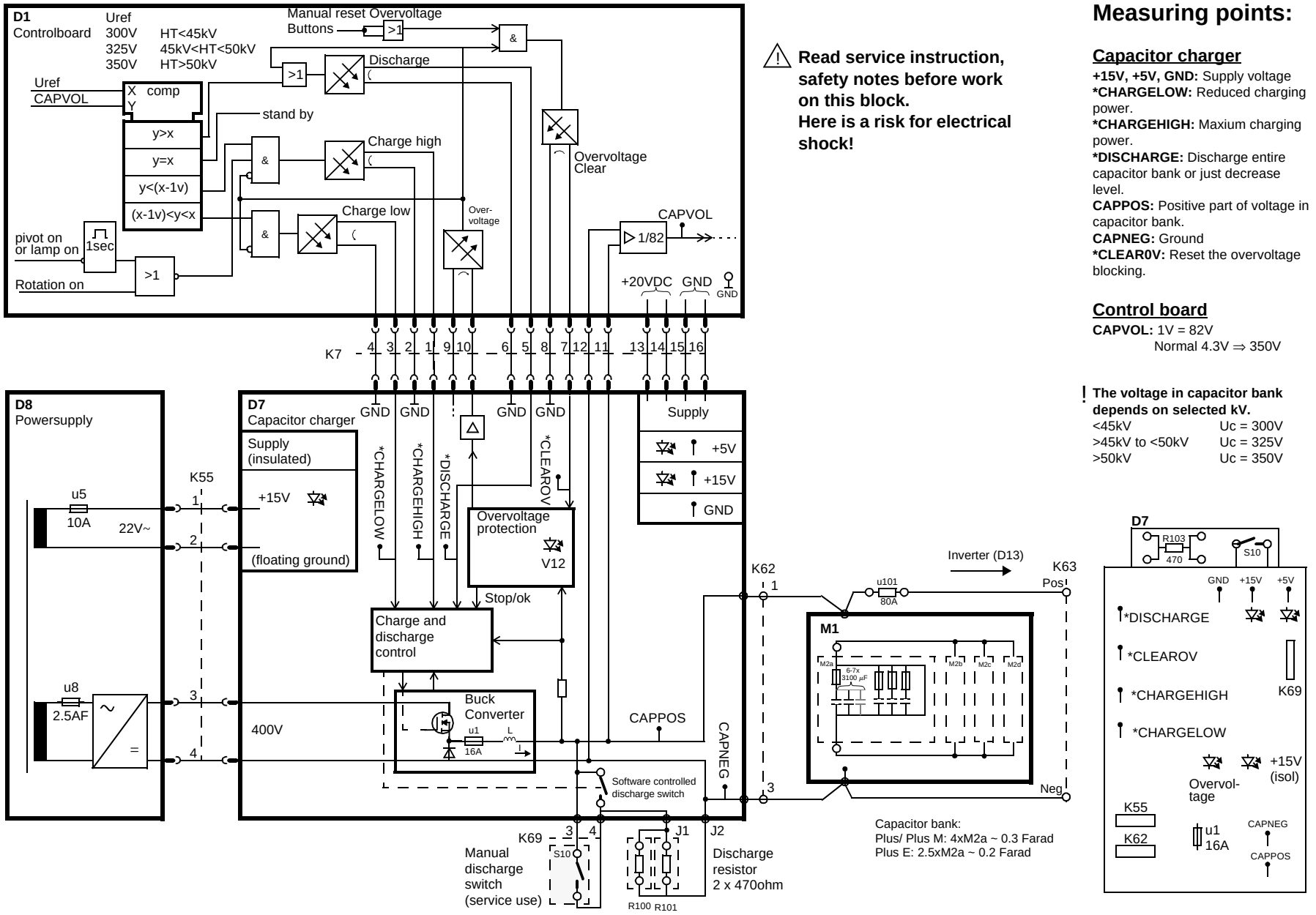
Power supply




Measuring points:
Control board
+15V, +5V, GND, -15V: Supply voltage
CAPVOL: 1V ⇒ 82V in capacitor bank
FILVAL: 1V ⇒ 1.5A filament current
FILVOL: 1V ⇒ 14V filament voltage.
Normal = 4.3V ⇒ 60V
HTNEG: -1V ⇒ -10kV Negative part of high voltage.
HTPOS: 1V ⇒ 10kV Positive part of high voltage
HTD: +-1V/40kV High voltage asymmetry.
HTNEG + HTPOS = HTD
HT: 1V ⇒ 40kV Tube voltage
HTPEAK: 1V ⇒ 40kV Peak value of tube voltage
MAPOS: 1V ⇒ 100mA
NOTE: The HT and MAPOS signals are described on page 141.
ROT: See page 150.
Mainreset
*RESET: Resets the C by an active low signal.
H1 Single tank Measured High tension pg.140
D13 Inverter INVA INVB pg.140
D4 Filament heating FIL Overcurrent pg.160
AEC Option
D1
K1 K2 K5 K9 K10 K13 K7 K8 K4 S1
CAPVOL
ROT FILVOL FILVAL MAPOS HT HTPOS HTNEG HTD HTPEAK *RESET GND +5V GND +15V -15V
V33 I66 I74 I72
Battery jumper
Back up battery
pg.110
HTNEG HTD HTPOS HT HTPEAK
Σ1/4 1/4
FILVAL FILVOL
MAPOS
C2 kV and mA tasks
166
2X (32KX8) I66+I74 (program) ROM
D4 Turnplate, lamp, rotation pg.150/160/170/180
LAMP ON ROTA ROTB
PIVOT ON PIVOT HOLD
ROT_VAL
Reset Circuit *RESET V33
Service switch PC switch (S1)
Communication
H1 Single tank Temperature pg.140
C1 Basic tasks 535
ROT
D3 Display pg.120
C in startup mode
N1 Button panel pg.120/180
kV+, kV-, mAs+, mAs- and lamp button.
Buttons pg.140/150/170
Lamp, turnplate prep. and exp.
DATA ADRESS
64kX8 I72 (program) ROM
Back up battery
32kX8 Storage for adapted values, errors etc. RAM
DATA ADRESS
CAPVOL
D7 Capacitor-Charger pg.130
CAPPOS CAPNEG
*CLEAROV *CHARGEHIGH
*CHARGELOW *DISCHARGE
D1 CPU

Display and user buttons






**Read service instruction, safety notes before work on this block.**
**Here is a risk for electrical shock!**

## Measuring points:

### Capacitor charger

**+15V, +5V, GND:** Supply voltage
***CHARGELOW:** Reduced charging power.
***CHARGEHIGH:** Maxium charging power.
***DISCHARGE:** Discharge entire capacitor bank or just decrease level.
**CAPPOS:** Positive part of voltage in capacitor bank.
**CAPNEG:** Ground
***CLEAR0V:** Reset the overvoltage blocking.

### Control board

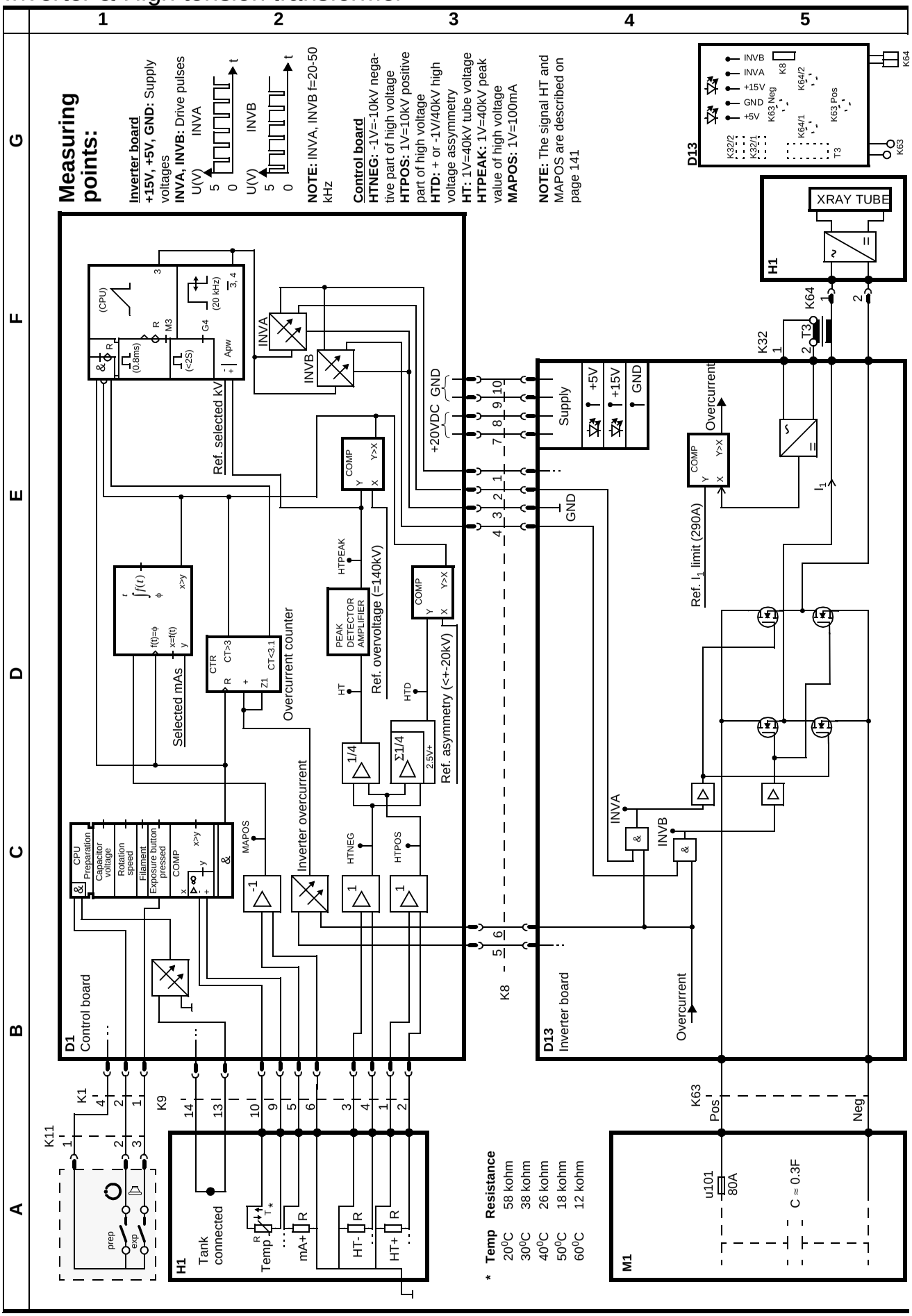
**CAPVOL:** 1V = 82V
Normal 4.3V ⇒ 350V

**! The voltage in capacitor bank depends on selected kV.**

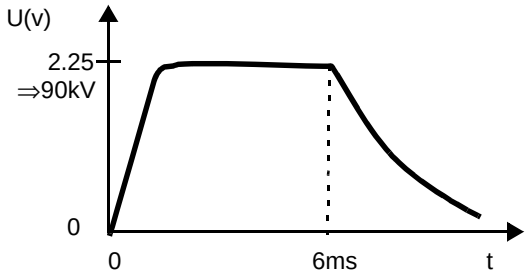
| | |
|---|---|
| <45kV | Uc = 300V |
| >45kV to <50kV | Uc = 325V |
| >50kV | Uc = 350V |

Siemens-Elema AB SPS-UD
Solna, Sweden
SPR8-215.051.01.06.02 MOBILETT Plus/ Plus E/ Plus M
65 68 583

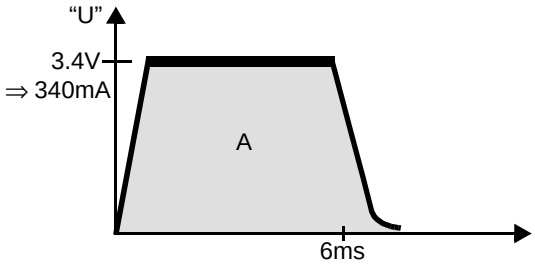
Inverter & High tension transformer



## Example: Exposure results 90kV 2.0mAs measured on D1




**HTPEAK** (1V ⇒ 40kV)



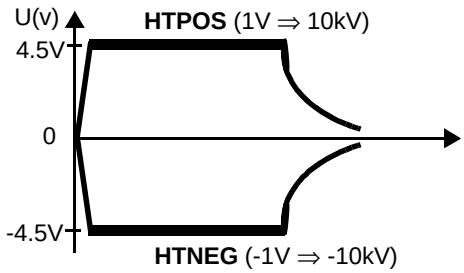

**MAPOS** (1V ⇒ 100mA)

**Calculating mAs**

mAs = current x exposure time

mAs = 340mA x 0.006s = 2.0mAs

**NOTE**: The signal contains high frequency 20-40 kHz and can cause sampling problems (Aliasing effect)

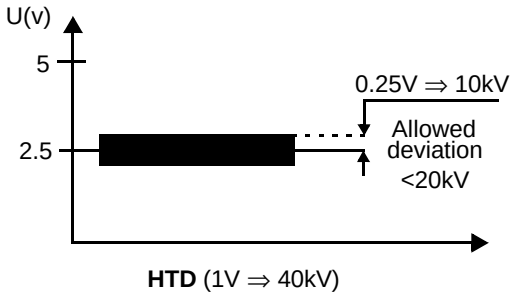



**HTPOS** (1V ⇒ 10kV)

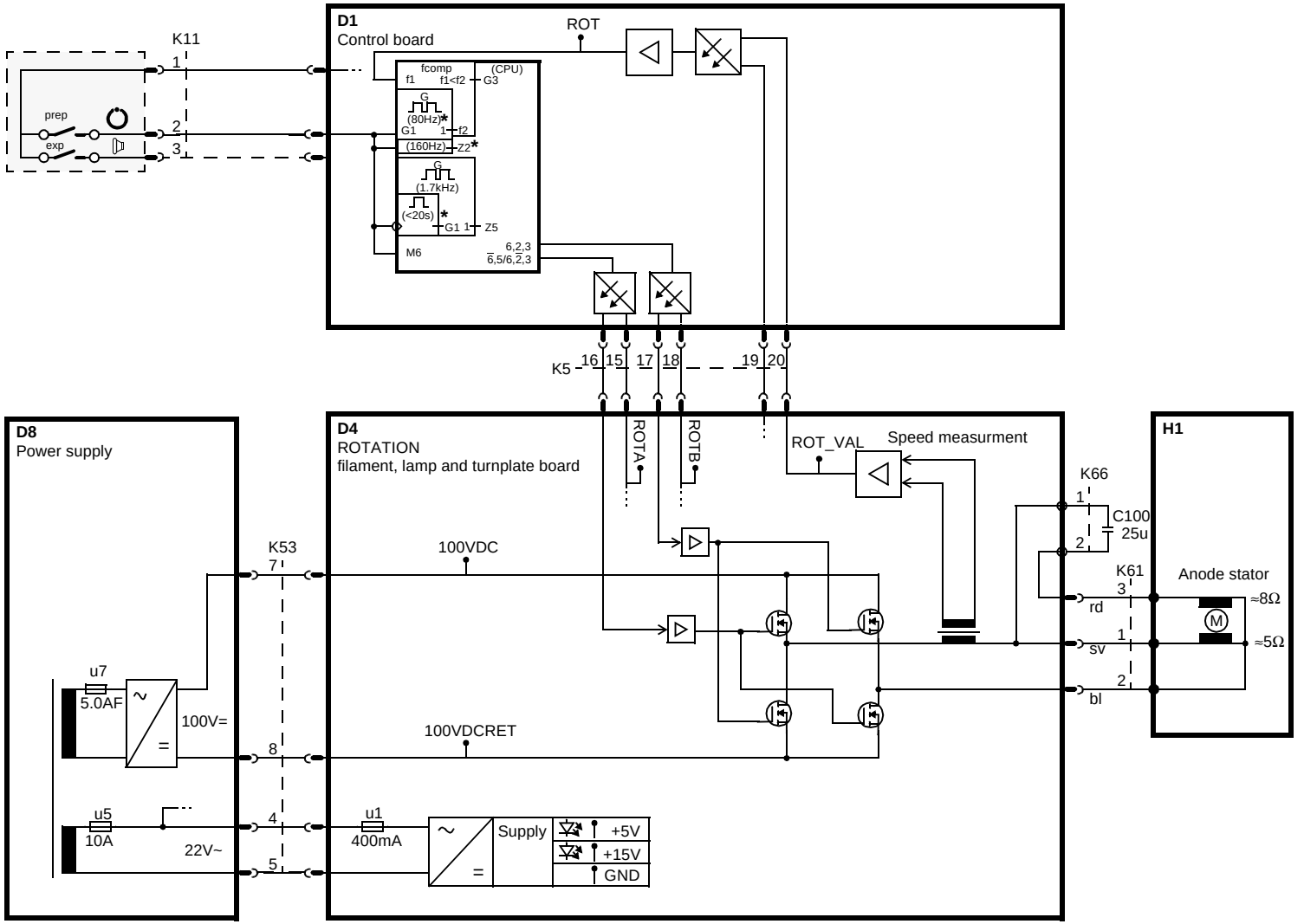
**HTNEG** (-1V ⇒ -10kV)

HTPOS-HTNEG = 4.5-(-4.5) = 9V

9V ⇒ 90kV

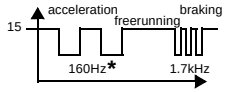



**HTD** (1V ⇒ 40kV)

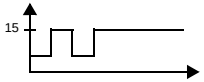



## Measuring points:

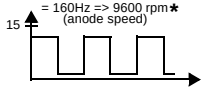
**Rotation board**
**+15V, +5V, GND, 100VDC, 100VDCRET**: Supply voltage
**ROTA**: Drive pulse A $180^0$ fase angular to ROTB.



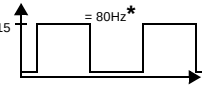

**ROTB**: Drive pulse B $180^0$ fase angular to ROTA.



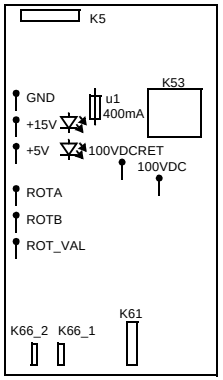

**ROT_VAL**: During freerunning.



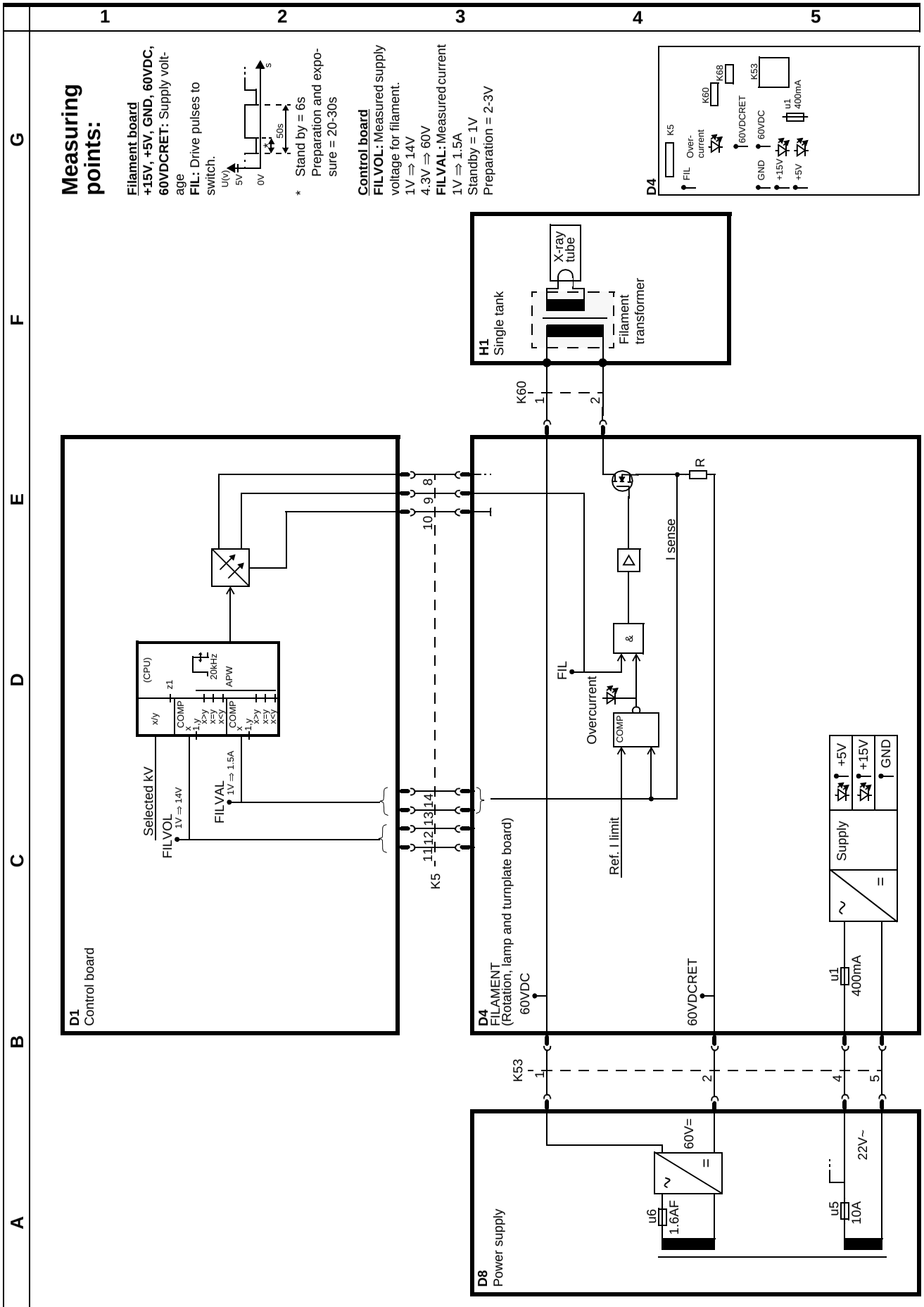

**Control board**
**ROT:** During freerunning



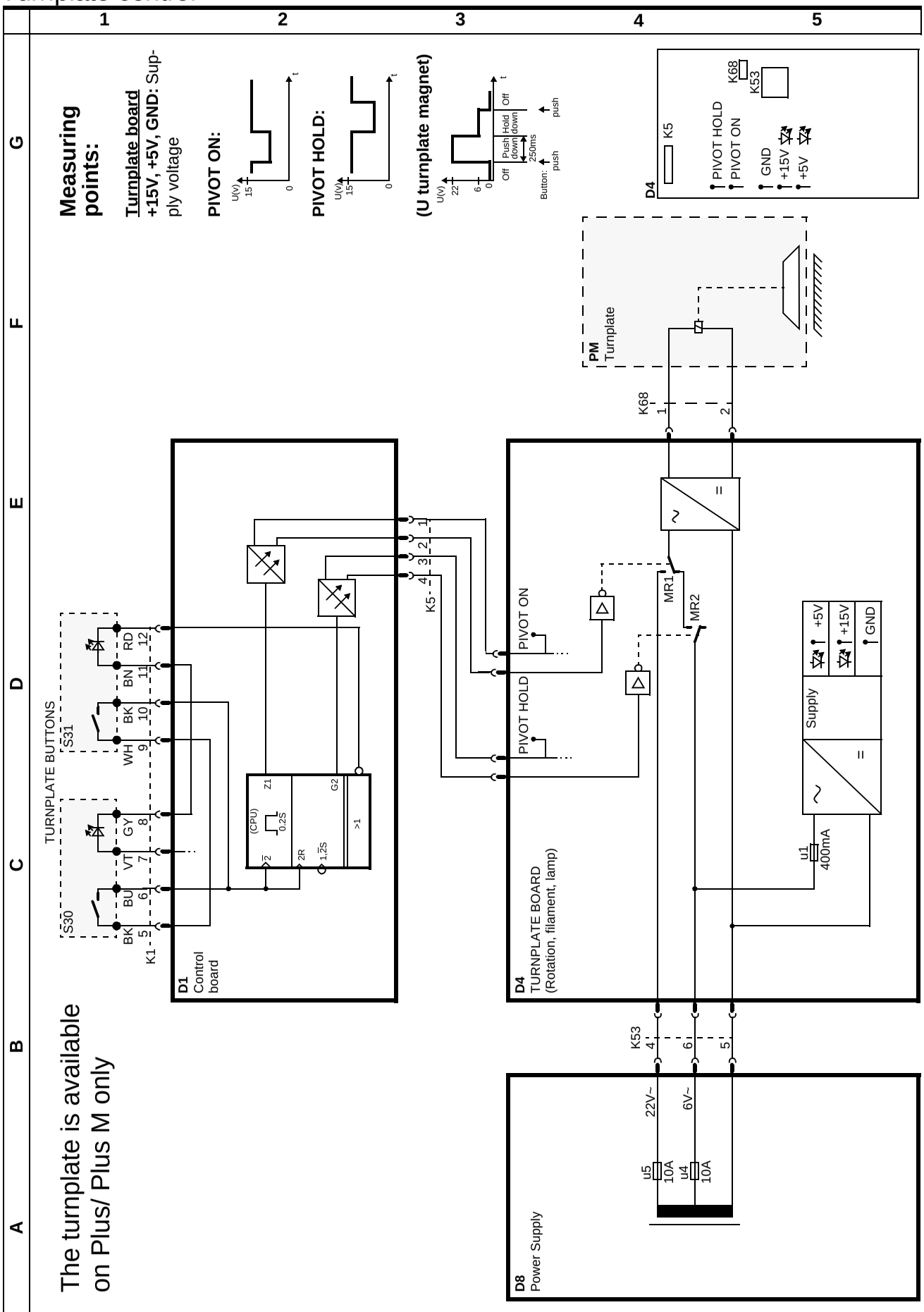

**D4**

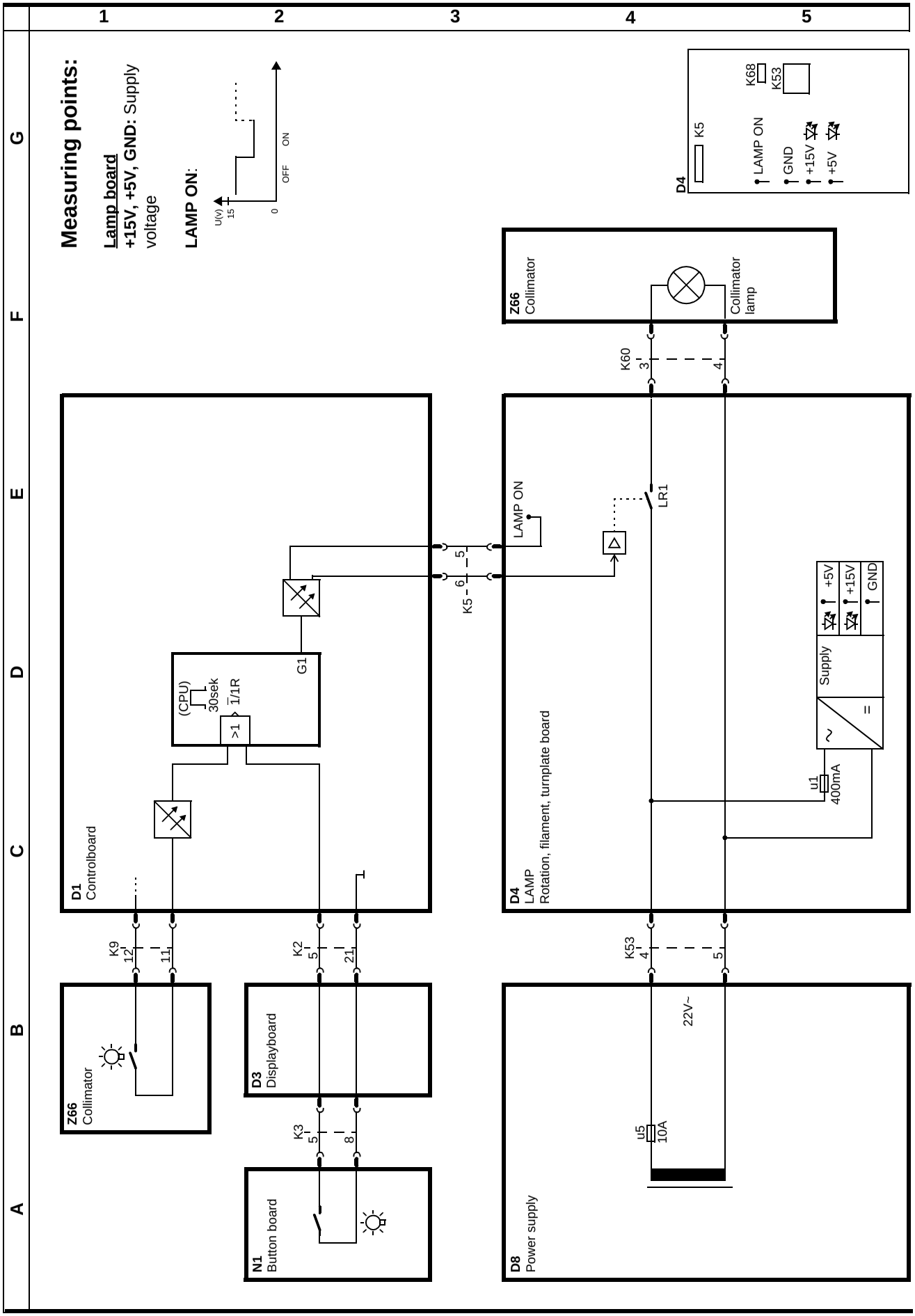



* Max preparation time = 10s if FW lower than V.1.2 or V.1.2E
Anod speed: ROT_VAL: During freerunning = 150Hz => 9600 rpm if FW lower than V.1.5 or V.1.5E
Control board: ROT: During freerunning = 75Hz if FW lower than V.1.5 or V.1.5E

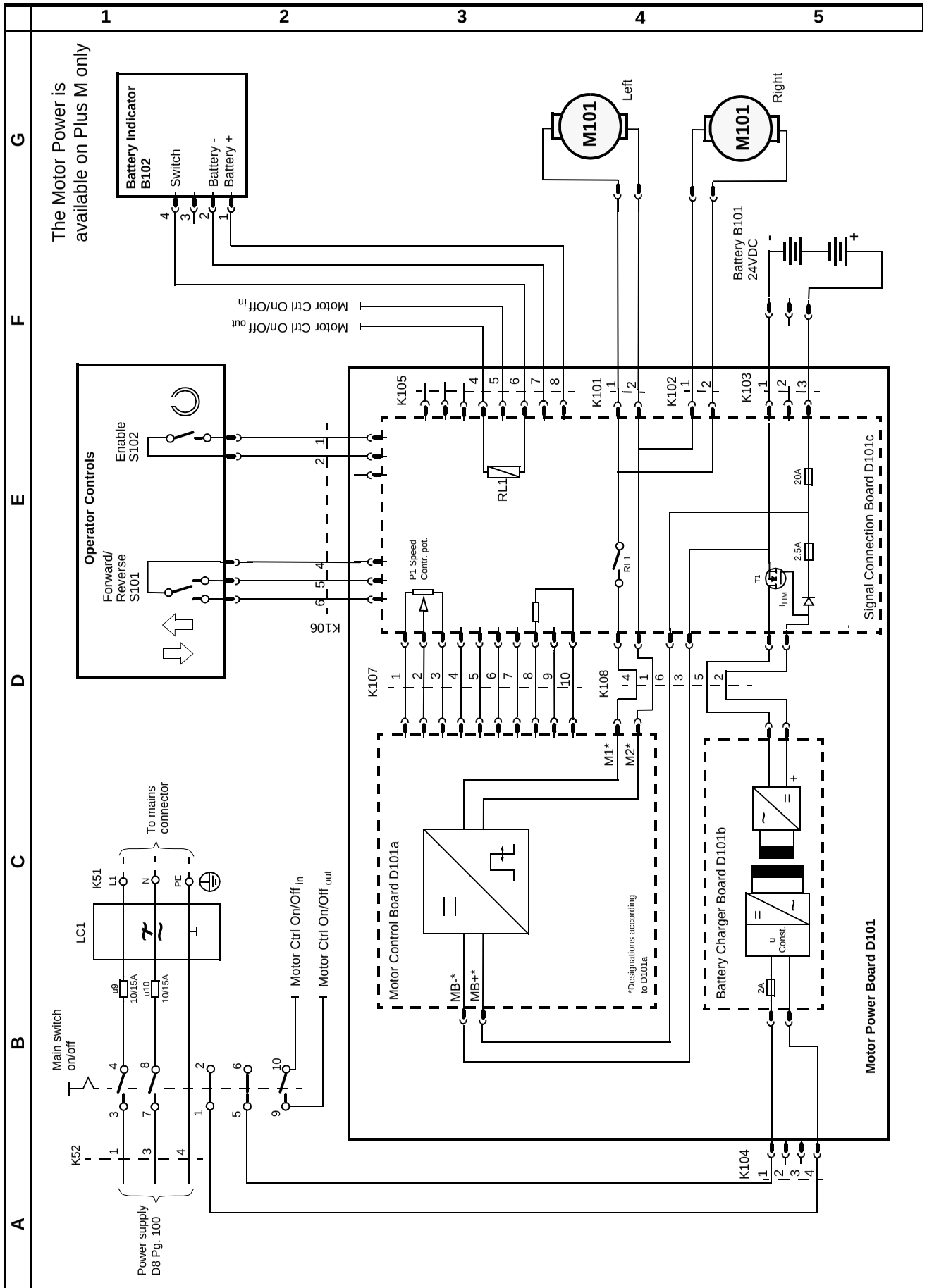

Measuring points:
Filament board
+15V, +5V, GND, 60VDC, 60VDCRET: Supply voltage
FIL: Drive pulses to switch.
U(V) 5V 0V
50s
s
* Stand by = 6s
Preparation and exposure = 20-30s
Control board
FILVOL: Measured supply voltage for filament.
1V ⇒ 14V
4.3V ⇒ 60V
FILVAL: Measured current
1V ⇒ 1.5A
Standby = 1V
Preparation = 2-3V
D4
K5
FIL
Over-current
K60
K68
60VDCRET
K53
60VDC
u1 400mA
GND
+15V
+5V
H1
Single tank
X-ray tube
Filament transformer
K60
D1
Control board
(CPU)
z1
x/y
COMP
APW
20kHz
Selected kV
FILVOL 1V ⇒ 14V
FILVAL 1V ⇒ 1.5A
K5
D4
FILAMENT
(Rotation, lamp and turnplate board)
60VDC
60VDCRET
R
I sense
FIL
Overcurrent
&
COMP
Ref. I limit
Supply
+5V
+15V
GND
u1 400mA
K53
D8
Power supply
60V=
u6 1.6AF
22V~
u5 10A

Turnplate control




1
2
3
4
5
A
B
C
D
E
F
G
Measuring points:
Lamp board
+15V, +5V, GND: Supply voltage
LAMP ON:
U(V)
15
0
OFF
ON
D4
K5
K68
K53
LAMP ON
GND
+15V
+5V
Z66
Collimator
Collimator lamp
K60
3
4
D1
Controlboard
(CPU)
30sek
>1
1/1R
G1
K5
5
6
LAMP ON
LR1
D4
LAMP
Rotation, filament, turnplate board
Supply
+5V
+15V
GND
u1
400mA
K9
12
11
K2
5
21
K53
4
5
22V~
Z66
Collimator
D3
Displayboard
K3
5
8
u5
10A
N1
Button board
D8
Power supply

Motor Power


The Motor Power is available on Plus M only
Battery Indicator B102
Switch
Battery -
Battery +
M101
Left
M101
Right
Battery B101 24VDC
Motor Ctrl On/Off in
Motor Ctrl On/Off out
Operator Controls
Enable S102
Forward/ Reverse S101
K105
K101
K102
K103
RL1
P1 Speed Contr. pot.
K106
K107
K108
Signal Connection Board D101c
20A
2.5A
T1
M1*
M2*
MB-*
MB+*
Motor Control Board D101a
*Designations according to D101a
Battery Charger Board D101b
2A
Motor Power Board D101
To mains connector
K51
LC1
L1
N
PE
u9 10/15A
u10 10/15A
Main switch on/off
K52
Motor Ctrl On/Off in
Motor Ctrl On/Off out
K104
Power supply D8 Pg. 100